Development of avian indicators and measures for monitoring threats and effectiveness of conservation actions – Grassland Birds

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This report generally follows the format recommended by "Guidelines for long-term monitoring protocols" (Oakley et al. 2003, Wildlife Society Bulletin, 31:1000–1003). A digital version of the AKN-compatible database, containing 2008 pilot data from a minimum of three Northeastern states, is submitted together with the report.

PART I – Protocol Narrative
1. Background and objectives

The Breeding Bird Survey (BBS) shows many grassland bird populations as rapidly declining and even approaching extirpation throughout significant portions of their ranges. The consensus of experts studying this problem is that habitat loss, fragmentation, and deterioration are the main culprits. As a result of these declines, 15 grassland bird species are listed by State Wildlife Action Plans in the Northeast as high priorities for conservation action (see Table 1), and several other species are acknowledged that will benefit from relevant conservation efforts. Needs pertaining to the conservation of grassland birds, include 1) increasing the amount of grassland habitat on public and private land in regions with the highest concentrations of grasslands, 2) implementing the new LIP and supporting existing private lands cooperative management programs to improve habitat for grassland birds on private lands, 3) working with public land managers, including NRCS, USFWS, and state wildlife agencies, to better direct funding and other resources to the highest priority areas and projects for grassland habitat management, and **4) developing and implementing a monitoring program to determine population trends and evaluate effectiveness of existing conservation efforts**. This project focuses on the fourth objective (monitoring), which needs to be intimately linked to any efforts addressing the other three.

As a variety of strategies and techniques are being implemented, assessing the effectiveness of these efforts requires additional effort, and is often overlooked. While the BBS demonstrates the need for conservation (as described above), it is rapidly losing its ability to track changes in ever-smaller grassland bird populations. In addition, the need exists for a coordinated and uniform approach to assessing the effectiveness of conservation actions. As a result, developing and implementing a monitoring program to determine population trends and evaluate effectiveness of existing conservation efforts has been identified as a critical need.

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Table 1. Bird species listed as grassland Species of Greatest Conservation Need (SGCN) by states in the northeastern US.

Species	States listing birds as SGCN
*American Kestrel**	*CT, MA, NJ, RI, VT*
*Barn Owl**	*CT, DE, MA, MD, NJ, NY, PA, RI, VA, VT, WV*
Bobolink	CT, DC, DE, MD, ME, NJ, NY, PA, RI, VT, WV
*Dickcissel**	*NJ, NY, PA, WV*
Eastern Meadowlark	CT, DC, MA, MD, ME, NH, NJ, NY, PA, RI, VT, VA
Grasshopper Sparrow	CT, DC, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT, VA, WV
Henslow's Sparrow	DE, MA, MD, NJ, NY, PA, VT, VA, WV
Horned Lark	CT, ME, NH, NJ, NY, RI, WV
Loggerhead Shrike	DE, MD, ME, NJ, NY, PA, VA, WV
Northern Harrier	CT, DE, MA, MD, NH, NJ, NY, PA, RI, VA, VT, WV
Savannah Sparrow	CT, DE, MD, NJ, RI
Sedge Wren	CT, DE, MA, MD, ME, NH, NJ, NY, VT, VA, WV
Short-eared Owl	CT, DE, MA, MD, ME, NJ, NY, PA, RI, VT, WV
Upland Sandpiper	CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT, VA, WV
Vesper Sparrow	CT, DE, MA, MD, ME, NH, NJ, NY, VT, WV

*Not finalized as members of the target population.

To maintain an effective scale for these efforts, very similar conservation and monitoring strategies are developing on a state-by-state basis across the Northeast. Initial partners in the collaborative monitoring component of the grassland conservation community include New Jersey (led by New Jersey Audubon Society), New York (Audubon New York) and Connecticut (Connecticut Department of Environmental Protection). A brief intro to each state's efforts follows.

New Jersey

Population demands have placed enormous pressure on agricultural landscapes, resulting in an alarming decline in grassland habitats and the birds that depend on them. Nearly 20% of New Jersey's endangered and threatened bird species, such as Grasshopper Sparrow (*Ammodramus savannarum*), Vesper Sparrow (*Pooecetes gramineus*), Bobolink (*Dolichonyx oryzivorus*), Savannah Sparrow (*Passerculus sandwichensis*), and Upland Sandpiper (*Bartramia longicauda)*, occur exclusively in grasslands. Less than 8% of land in NJ, however, is in cropland or pastureland of 100 acres or more.

Recognizing that proper management of grasslands is essential to keeping common grassland species common and declining species stable, in 2004 the New Jersey Habitat Incentive Team (NJHIT), a coalition of conservation organizations, state and federal agencies and sportsman groups, was formed. The goal of the coalition is to implement ecologically sound habitat management practices throughout the state. NJHIT identified an important focal grassland area in Warren, Somerset and Hunterdon Co. that supports over 25% of the remaining agricultural land in NJ. The New Jersey Wildlife Action Plan also clearly highlights that the grasslands in portions of these three counties are a critical focus area for wildlife habitat preservation and enhancement efforts. This area, which includes Duke Farms, the historic grasslands of the Amwell Valley and Six-Mile Run, is in critical need of additional permanent

land preservation and wildlife habitat enhancement. This area also provides an opportunity at an appropriate scale to manage grassland habitat for area sensitive species.

Within this focal area, the Raritan Piedmont Wildlife Habitat Partnership (RPWHP) was formed in 2005 to increase wildlife habitat connectivity and to implement action items detailed within the NJ Wildlife Action Plan. The Partnership consists of public and private agencies, including representatives of Somerset County, and Hillsborough Township, NJ Audubon Society, Conserve Wildlife Foundation, the D & R Greenway Land Trust, the New Jersey Conservation Foundation, the Sourland Planning Council, Watershed Association, Stony Brook Millstone Watershed Association, and Duke Farms.

To date the Partnership has jointly prepared a Grassland Conservation Plan which is scientifically based and spatially explicit (Ettel 2006). The conservation plan has resulted in the acquisition and restoration at a dozen sites covering more than 1,000 acres in Somerset and Hunterdon County. In addition, since 2006 land biologists working with NJ DEP have facilitated the enrollment of over 3,000 acres of agricultural grasslands in the federally sponsored landowner incentive programs (LIP).   Since 2006, New Jersey Audubon Society's (NJAS) Citizen Science program, in collaboration with the NJ Division of Fish and Wildlife, Endangered and Nongame Species Program, has been monitoring bird responses to conservation-based management of grassland.

New York

Audubon New York, with support from the New York State Department of Environmental Conservation (NYSDEC), is coordinating a comprehensive grassland bird conservation effort in New York State—a conservation priority highlighted in New York's Comprehensive Wildlife Conservation Strategy. A significant portion of this initial effort culminated with the drafting and implementation of a grassland bird conservation plan (Morgan and Burger 2008). A New York grassland bird partnership group has been formed to help determine the approach and strategies for this planning effort, and is committed to its implementation.

In New York, grassland bird population declines are also linked strongly to the loss of agricultural grasslands, primarily hayfields and pastures. Because the vast majority of grasslands in New York are privately owned hayfields and pastures, it would be impossibly expensive to protect all of them through conservation programs that focus on acquisition and management of public lands. Therefore, regions of the state where grassland birds are most likely to persist, i.e. focus areas, have been identified and will be targeted for surveys and monitoring and serve to focus conservation resources—particularly incentive programs that encourage proper management of private lands, although proper management of publicly-owned lands in these areas is also important to this effort.

Two immediate priorities for implementing the plan is enrolling private landowners in relevant conservation programs, and ensuring that they (as well as all publicly-owned "conservation grasslands") are receiving appropriate management. New York's Landowner Incentive Program (LIP) was created in response to this need, and approximately 1,300 acres have been enrolled, with additional funding available to enroll approximately 500 additional acres. Following a review of the initial application period, a refined application period for the remaining LIP funding is expected to occur during the winter of 2008/2009.

A joint application by NYSDEC and Audubon New York for funding through the State

Acres For wildlife-Conservation Reserve Program (SAFE-CRP) was approved by the USDA, and funding for 4900 acres was approved. The sign-up for this program began during the summer of 2008, and will continue until all the acres have been allocated. The basic template for the Site Conservation Plans was modeled after the Landowner Incentive Program, and the eligibility criteria that the land must be active farmland is a critical part in the effort to reverse the widespread loss of suitable breeding habitat to intensive agricultural practices.

The inclusion of public land managers in the conservation planning process has proved invaluable as an educational and consensus building tool. By participating directly in the collection of pertinent data, the land managers were poised to incorporate the principles of the Conservation Plan in their site-specific plans and habitat management activities. In addition, the habitat management elements of the plan have been used for grassland conservation efforts beyond New York in Pennsylvania and Ontario, CA.

As the various conservation partners begin to direct their available resources towards the grassland conservation effort, a standardized approach to monitoring will facilitate adaptive management of these programs and will also allow analysis of both the individual and cumulative impacts of these efforts.

b. Rationale for selecting this resource to monitor

The magnitude of the declines in grassland breeding bird populations along with the socio-economic forces driving habitat change are so great that the effectiveness of the conservation initiatives at preserving sustainable populations is not guaranteed. Creation of a detailed monitoring protocol targeting grassland birds in their habitats across the Northeast and studying the effectiveness of management prescriptions administered through several conservation programs is a necessary part of the overall effort.

The NE Coordinated Bird Monitoring Partnership has provided an ideal forum for collaborating among the northeastern states, and has led to a pilot season in 2008 to test various protocols for collecting data which can be used to evaluate the effectiveness of the private and public land conservation programs that are targeting grassland breeding birds.

Grassland birds provide a practical set of umbrella species for determining habitat changes because they are easily recorded using standard monitoring methodology. Since there are only a few focal grassland bird species in the Northeast, volunteers can be easily trained in identification and can reliably provide information on abundance of these species. Furthermore, the recent conceptual framework for monitoring the effects of restoration on wildlife advocates using measures of population dynamics for a set of indicator or umbrella species that can constitute a 'restoration assemblage' (Block 2001, Lambeck 1997).

The data collected will be used to evaluate the effectiveness of Landowner Incentive Programs at protecting critical habitat patches for grassland birds, and will serve to compare abundances and densities of targeted birds on conservation grasslands with those on unprotected habitats.

c. Measurable objectives

Metrics that we can use to determine to success of this monitoring project include:
- **Total number of acres/sites/points being surveyed.**

- **Total number of volunteers involved in the survey and providing usable data.**
- **Abundance and distribution of recorded grassland birds.**

2. Sampling design
a. Rationale for selecting this sampling design over others

The point count survey protocol was designed to allow distance sampling (Buckland et al. 2001, Diefenbach et al. 2003) and time-depletion removal methods (Farnsworth et al. 2002), to account for biases in population measures resulting from imperfect observer detection. Distance sampling methods model the bias in detection that occurs as a monotonically declining function of distance from the observer (i.e., birds that are further from the observer, are less likely to be observed). Removal methods model the biases related to differences in avian singing rates (i.e., birds that sing less frequently, are less likely to be observed).

Analysis of the 2008 data is underway, with the objective of refining the protocol for further implementation in 2009 (discussed below).

b. Site selection

In New Jersey, selected sites for the 2008 NE-CBM study are part of the Raritan-Piedmont Wildlife Habitat Partnership (RPWHP) project area which encompasses portions of 15 townships in Somerset and Hunterdon Counties in the Central Piedmont Plains of New Jersey (208 square miles). These sites are either established grasslands, sites currently being restored, or sites where grassland restoration is planned in the near future. The 2008 survey included 79 survey points at 13 RPWHP sites.

In New York, surveyed sites (78 points) included properties enrolled in the Landowner Incentive Program, sites considered for but not enrolled in the Landowner Incentive Program, and randomly selected potential grassland patches throughout the grassland focus areas. A spatially-balanced sampling design using RRQRR (Reversed Randomized Quadrant Recursive Raster; Theobald et al. 2007) was attempted for the selection of sites not enrolled in LIP, but was not fully implemented. Future site selection beyond sites enrolled in conservation programs will follow the RRQRR or a similar spatially balanced design.

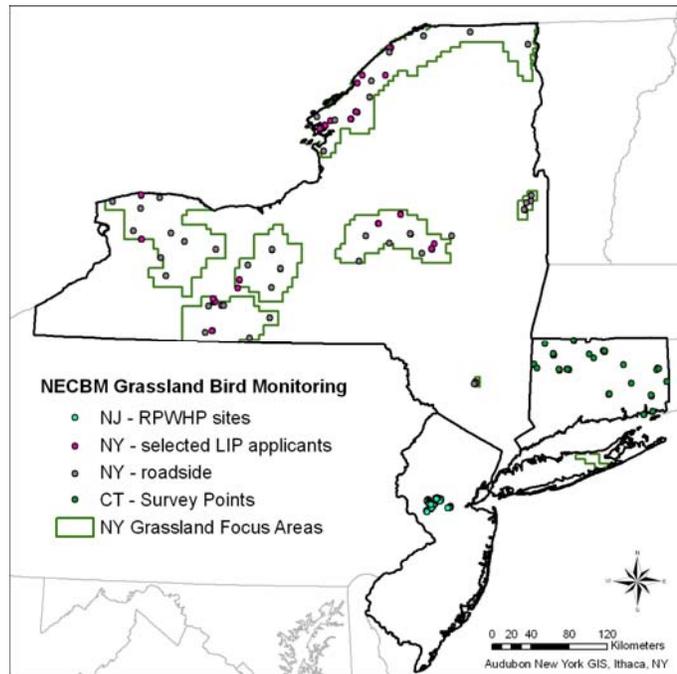Connecticut's survey effort (55 points surveyed) was focused on publicly-owned grasslands.

Fig. 1. Points surveyed in 2008 by members of the grassland working group of the NE CBM partnership.

i. Criteria for site selection; define the boundaries or "population" being sampled

The majority of sites sampled in 2008 were either enrolled in private lands conservation programs or publicly-managed grasslands, due to immediate obligations to monitor these properties. Sites enrolled in the various conservation programs are known to be managed as grassland habitat. However, as one objective of the monitoring program is to assess population trends at the regional scale, other sources of potential grassland habitat should be included in the sample population as well. New York evaluated options for including additional sources of potential habitat. However, the scale of the focus areas (boundaries of the monitoring effort) in New York prevented the use of a rigorous screening process for every potential habitat patch (such as reviewing orthophotos prior to conducting a monitoring visit), so all possible landcover classes from the National Land Cover Dataset (NLCD 2001) that may contain grassland habitat were pooled as potential habitat. Large (>100 acres) patches were selected, and subsequently screened (using orthophotos or site visits) for inclusion in the sample population. Future monitoring further incorporate a spatially balanced sampling design that allows comparison between "conservation" grasslands and other potential habitat.

ii. Procedures for selecting sampling locations; stratification, spatial design

Established procedures (SOP 4) are used to establish survey points.   The goal was to fit as many survey points within the boundary of the selected property as possible to maximize the amount of data that could be collected per site. We used an inter-point distance of 400m to reduce the probability of double-counting individual birds during the survey. Vector grids were created using ET GeoWizards 9.6.1 for ESRI ArcGIS 9.2 as an accurate and efficient method of locating the survey points within the property boundaries.

c. Sampling frequency and replication

Surveys were repeated two times during the breeding season at each survey point. The first survey was conducted roughly between May 15th and May 31st, 2008; the second survey was conducted between June 1st and June 15th, 2008. The two surveys at each site/route were conducted at least seven days apart.

d. Recommended number and location of sampling sites

New Jersey surveyed only the RHPWP subset of sites under the NE-CBM grant, while additional state and federally managed sites were surveyed with support from SWG. *For the purposes of our NJ study, we recommend selecting all sites managed for grassland habitat under various programs (also see 2.b.i, above). Within the boundaries of each site, the goal is to establish as many survey points as possible, while maintaining an interpoint distance of 400m.* While data analysis has not been completed and any type of power analysis resulting from our data may give us a slightly different outcome, we suggest setting up monitoring efforts in 'quasi-experimental' design rather than an observational study, to allow for stronger inferences on the effects of restoration on bird populations (Block et al. 2001). We recommend following a general Before-After-Control-Impact (BACI) design (Green 1979), modified by using multiple

controls and replicated experimental (managed) sites. The use of controls will allow us to distinguish natural, year-to-year variability from spatial variability. That is, if variation among controls in both space and time is less than variation among restored sites, or between restored and control sites, then we would conclude that observed differences are the result of management regimes.

We recommend surveying an equal number of control and managed points. Control points can be randomly selected from potential grassland bird habitat. We anticipate that we would need to survey 300-400 points between controls and managed sites to develop data sets that can be used for adaptive management at land incentive program sites in New Jersey.

While it is critical to effectively monitor sites actively managed for grassland birds, landscape level effects will likely confound trend monitoring if only managed sites are surveyed. A balanced sampling frame will need to include other potential grassland bird habitat for effective population monitoring.

e. Recommended frequency and timing of sampling

Current surveys are timed to overlap with the peak of the breeding season, when grassland birds are on territory and highly detectable. Surveys are repeated during each of two survey periods: May 15-31 and June 1-15.

As most sites in NJ (and many in NY) are managed through planting native warm season grass that takes 2-3 years to become established, it is essential to continue surveys of managed lands for at least 5 years. NJDEP ENSP and NJAS have committed at a minimum to survey all LIP/WHIP sites for the duration of their contract (typically 5 years) although funding for these efforts has not been secured. Although Audubon New York has committed to monitoring LIP sites for a minimum of one additional year, tentative agreements are being developed committing Audubon New York to coordinating long-term monitoring for LIP, CRP, and additional programs.

f. Level of change that can be detected for the amount/type of sampling being instituted.

Ultimately, as our conservation objective is to stabilize or reverse the declining trends of grassland bird populations (if possible) within appropriate areas (focus areas) the design of the survey effort will need to be capable of determining any success. The magnitude of the current population declines demands prompt action for any hope of success. Therefore, the survey effort should be designed to detect any significant populations in a relatively short amount of time, although the costs of such a program will also need to be considered. The ability of the current program to meet these needs will be assessed as part of the ongoing analysis.

3. Field methods
a. Field season preparations and equipment setup (including permitting and compliance procedures).

Not applicable.

b. Sequence of events during field season

Training sessions were held for volunteers and technicians during late April and early May. Surveys were repeated two times during the breeding season at each survey point. The first survey was conducted roughly between May 15th and May 31st, 2008; the second survey was conducted between June 1st and June 15th, 2008.

c. Details of taking measurements, with example field forms

In New Jersey, observers performed standardized five-minute fixed-radius point count surveys to record the numbers of ten primary target grassland bird species: American Kestrel, Bobolink, Eastern Meadowlark, Grasshopper Sparrow, Horned Lark, Northern Bobwhite, Savannah Sparrow, Upland Sandpiper and Vesper Sparrow. Three secondary targets (Henslow's Sparrow, Sedge Wren and Dickcissel) were also recorded. Surveys took place from one half hour before to four hours after sunrise (approximately between 5:30 AM and 9:30 AM) and were not conducted during rain or periods of high winds (greater than 12mph {Beaufort 3}).

Surveys were designed using two different methodologies to permit distance (Buckland et al. 2001, Diefenbach et al. 2003) and time removal (Farnsworth et al. 2002) analyses. At three sites (30 points), observations were recorded in one-minute time bands and three distance classes: less than 25m, 25 to 200m, and greater than 100m. At the remaining 10 sites (49 points), observations were recorded in one-minute time bands and exact distance was estimated using a laser range finder when possible. Detection method was recorded for all observations as heard only, seen only or seen and heard. Example field data sheets are provided in SOP 5a and 5b.

During each of the two site visits, volunteers also conducted a general habitat assessment, including overall habitat category (upland or wetland), habitat class, and average vegetation height (SOP 6).

d. Post-collection processing of samples (e.g., lab analysis, preparing voucher specimens)

In general, requiring observers to individually enter datasheets into a database (as promptly as possible) can prevent complications associated with interpreting hand-written information. However,

e. End-of-season procedures

Quality control of data entered into the relevant databases
Transfer of appropriate data to AKN archives.

4. Data handling, analysis, and reporting
a. Metadata procedures

Currently, metadata reporting is not standardized among the participating states, since each state is currently maintaining individual data archives. The relevant metadata is incorporated within protocols and training materials. This component will be improved once a uniform protocol is developed.

b. Overview of database design –

All NJ data were entered on the NJAS grassland data web page and uploaded directly to Microsoft Access for analysis. The web site is password protected preventing access by anyone other than volunteer surveyors. The site was designed to be user friendly with pull-down menus for all of the data entry fields, including point information (site, point, weather conditions), habitat information and bird sighting information. The site design was created to match the layout of the field datasheets to simplify data entry.

NY Audubon is currently developing a database in conjunction with an outside consultant that will have similar types of fields as the NJS database with plans to be able to transfer data directly to the AKN and partnering organizations at the end of each field season.

c. Data entry, verification, and editing –

Volunteers entered data into the online database. Staff QA/QC'd datasheets of the on-line submitted data by comparing them with the original field datasheet. Specific data were collected on error rate to determine efficiency of the online data entry. Error rate was very low (only 4%), however, many of our volunteers are repeat counters who have entered data in previous years. New volunteers may exhibit higher data entry error rate.

d. Recommendations for routine data summaries and statistical analyses to detect change

Data have been transferred to Frank Rivera at Patuxent and he is the process of analyzing them. However, below is the methodology we propose undertaking and recommend for future statistical analyses.

We will combine distance and repeated sampling for parameter estimation and modeling (Buckland 2001, 2004; Royle and Dorazio 2008). Conventional and multiple covariate distance sampling will be used to estimate detection probability, density, and abundance of grassland birds across points. Following Royle and Dorazio (2008), distance sampling will be extended to estimate density at point level. For comparison, repeated sampling with covariates will be used to estimate detection, abundance (lambda) and density (lambda/area) at point level using mixture models (e.g., Royle-Nichols abundance-induced heterogeneity and Royle repeated count models; see Royle and Nichols 2003, Royle 2004).

Abundance and detection can be affected by similar or different covariates. We will study the effect of factor and continuous covariates, such as observer, habitat type, time of day, date, and form of detection (Marques et al. 2007, Kéry 2008), and will use an information-theoretic approach for model selection and inference (Burnham and Anderson 1998). Classical and Bayesian frameworks will be combined for data analysis. Data analyses conducted for grassland birds will replicate analyses conducted for high-elevation forest birds to refine and standardize survey protocol. Improvements to survey design and counting methods will add credibility to point-count data generated by monitoring programs as part of the Northeast Coordinated Bird Monitoring Partnership (NCBMP 2007).

e. Recommended reporting schedule.

Annual summary reports to the partnering organizations is recommended. However, Frank Rivera has been identified as the lead for statistical analysis, and annual reports conforming to the format needed for the relevant analysis will be provided.

f. Recommended report format with examples of summary tables and figures

See attached files:
- Templates provided by Frank Rivera for data entry – Appendices 1A and 1B
- Bulleted outline report that includes information on volunteer participation, training, total number and types of sites surveyed, total number and types of points surveyed, and number of focal species recorded (Appendix 2)
- Table on frequency of occurrence and abundance of focal species recorded (Appendix 3 -- example)
- Figure on total counts of grassland bird species including data from previous years (Appendix 4 -- example)

g. Recommended methods for long-term trend analysis (e.g., every 5 or 10 years)

To be determined.

h. Data archival procedures –

Field datasheets and photocopies are maintained by NJAS. The electronic database is stored online and backup copies maintained by NJAS staff. Data will be formatted and submitted to the Avian Knowledge Network (AKN) for additional archiving.

5. Personnel requirements and training

a. Roles and responsibilities –

NJAS staff recruited, trained and coordinated volunteers for the grassland survey. Volunteers were responsible for completing surveys at their assigned sites.

b. Qualifications –

Volunteers were selected based on their bird identification skills, and initially screened by NJAS staff through a presentation and understanding of the survey's requirements. NJAS staff screened volunteers carefully during the trainings and through personal interactions. In addition, volunteers were able to screen/test themselves to ensure that their birding skills are at the appropriate level. Variations in the volunteers' identification skills were not measured quantitatively.

c. Training procedures –

Two 4-hour volunteer training workshops and two voluntary field seminars were held for instruction on visual and auditory identification of target species, data collection and recording, species observation mapping, distance sampling, and web-based data entry. Workshops focused on providing volunteers with the necessary materials to complete the surveys including maps of all survey points, aerial photographs of each survey point, detailed protocol, data sheets, bird song CDs, target species identification PowerPoint, and access permission letters. Volunteers that did not attend workshops picked up their materials at Scherman-Hoffman Wildlife Sanctuary or were mailed packets.

The southern New Jersey workshop was held on April 12, 2008, and the northern New Jersey workshop was held on April 26, 2008, at Scherman-Hoffman Wildlife Sanctuary. Voluntary field trips, focusing on identification of target species and survey methodology were conducted at Duke Farms on May 21 and 24, 2008.

6. Operational requirements

a. Approach to survey enhancement, expansion and implementation throughout the Northeast

Further development of this monitoring partnership will continue beyond the production of this report, and many opportunities exist for further improving protocols, data management, and analyses. In addition, insufficient data has been collected to determine the success of existing and newly created conservation programs, so this critical need has not been met.

Some of the key opportunities for expansion of the survey effort throughout the Northeast include the partnership and relationships created through the Northeast Coordinated Bird Monitoring effort, along with newer initiatives such as the grassland working group of the Audubon Eastern States Alliance, the US Fish and Wildlife Service's initiative to improve monitoring of high priority breeding bird populations, and groups working on implementation of Bird Conservation Region plans (particularly BCR 13).

b. Annual workload and field schedule

The New Jersey monitoring program is the most mature of the states that participated in the 2008 pilot season. The following analysis of workload and schedule needs is based on that experience.

Per each state that participates annually in the monitoring effort, we estimate that 400 points that need to be surveyed twice each would require approximately 80 volunteer field days, assuming that each volunteer can survey 10 points per morning. We typically assign each volunteer only 2 field days, or approximately 10 points, which results in a need for about 40 volunteers.

A volunteer coordinator would need to spend approximately 8 months effort during the initial stages of the project

February- June: full time effort to develop materials, select sites and points, and to recruit, train and coordinate volunteers undertaking the surveys.

July- August: half time effort addressing end-of-season concerns, and soliciting, collecting and proofing data.

September-October: fulltime effort to complete any pending data entry, complete data proofing

and prepare reports.

A senior biologist would expend approximately one month to support data analysis, report preparation, and coordination with partners.

After the initial year of the project a volunteer coordinator is still required but at a lower effort level, approximately a 4 month commitment.
April – full time to initiate the survey for the year
May-August – half time to handle volunteer concerns, undertake surveys at sites that are not assigned or if volunteers are unable to complete their surveys, and collecting habitat information
September – full time to process and finalize the data.

c. Facility and equipment needs

Internet and phone access for volunteer coordination.
GIS capability to produce maps and map bird data.
Range finders for the volunteers involved in distance sampling – we estimate that even if only a subset of volunteer is assigned this methodology a minimum of 20 range finders would be needed.

d. Startup costs and budget considerations

Please see attached budget.   We estimate a total budget of $50,000 to launch and $30,000 to maintain the program once it is launched, per state that participates.

7. References

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PART II – Standard Operating Procedures

SOP 1: Preparations and Equipment Setup Prior to the Field Season – Not applicable at this time.

SOP 2: Training Observers – example NJAS training agenda

<u>**NJAS Grassland Monitoring: Citizen Scientist Training Session Agenda**</u>

10:00AM – 2:00PM, April 12, 2008, Rancocas Nature Center

1. **Introduction**
   - Overview of NJAS Citizen Science
   - Background information about grassland birds in NJ
   - Goals and objectives of the grassland monitoring project

2. **Species Identification**
   - Review of target species and other species likely to be observed, by sight and sound

3. **Methodology**
   - Packet contents – site and count circle maps, datasheets, protocols, identification CDs, access permission letters, vehicle signs
   - Bird survey protocol
     - Pre-survey scouting
     - When to conduct surveys
     - Point count survey methodology, including distance sampling
     - Target species mapping
   - Habitat survey protocol
   - Online data entry

4. **Site and point assignments**

SOP 3: Using the Global Positioning System – Not applicable at this time.

SOP 4: Establishing and Marking Sampling Plots –

<u>**How to Establish Survey Points Using Vector Grids in ArcGIS**</u>
<u>**Mike Bisignano, NJAS**</u>

We developed methodology for establishing survey point locations with a fixed inter-point distance to use in bird point count surveys at Landowner Incentive Program sites (LIP), Wildlife Habitat Incentive Program (WHIP) sites and other sites with existing property boundaries. We used an inter-point distance of 400m (1,312.33596 feet), which followed the standard distance used by ENSP staff in 2005 to reduce the probability of double-counting individual birds during the survey. We used a vector grid as an accurate and efficient method of locating the survey

points within the boundaries of the subject property and an interpoint distance of 400m (1,312.33596 feet) to reduce the probability of double counting individual birds during the survey.

Vector grids were created using ET GeoWizards 9.6.1 for ESRI ArcGIS 9.2, which is a free extension available at http://www.ian-ko.com/. In the ET GeoWizard **basic menu** there is a function for creating vector grids. Select the sub-menu item **vector grid**. This function allows the user to select the reference source layer (the property boundary) to grid, the grid type (polygon or polyline) and the cell size in US feet. For the purposes of this survey the reference source layer is the LIP, WHIP or other property boundary. The grid type selected is polygon and the cell size is 1,312.33596 feet (400m) for both the X and Y vertices. This produces a grid with enough cells to cover the entire area of the selected property. The number of cells will vary depending on the size of the property.

The goal was to fit as many survey points within the boundary of the selected property as possible to maximize the amount of data that could be collected per site. In order to do this, we selected the grid in ArcGIS and rotated it so that the long axis of the grid was as parallel to the long axis of the selected property as possible**.**

It is critical that the most up to date aerial photos are used as the background as many of the property boundary shapefiles delineate the boundary of the *entire site,* not just the agricultural fields being managed. By using the aerial photos the user can visually assess the location of the grid upon the existing landscape, thus enabling the user to adjust the grid appropriately to best align the survey points within the boundary of the managed parcel (a subunit of the entire property/site). We did not employ a minimum distance-to-edge protocol, but attempted to center the grid in each specified parcel to include as many vertices as possible as a means of covering as much of the parcel as possible within count circles (to be discussed below).

Once the grid was aligned properly, survey points were be established. Survey points are easily created with the GeoWizards **convert menu**. This menu includes a function that allows the user to locate points at the vertices of the grid by selecting the option **Polygon to Point**. This will place a single point at each vertex in the grid. Using this methodology we created survey points 400m apart. Once the points were established all extraneous points that fell outside the property boundary or within a parcel or habitat that is not part of the survey (forest, development, etc) were deleted. The resulting points are the final set of points that were used for bird survey.

Based on our bird survey protocol, two count circles were created around each survey point, using that point as the center of each circle. ArcGIS 9.2 provides a **multiple ring buffer tool** (*ArcToolbox>Analysis Tools>Proximity>Multiple Ring Buffer*) which creates rings around a center point at multiple radii determined by the user. For our surveys the count circles were created at two radii (25m and 100m).

Once the count circles were established maps were generated that show the location of the property, parcels, survey points and circles. These, along with a list of the coordinates for each survey point were provided to all observers so that they can accurately locate the survey point

and return to them on each site visit.

SOP 5: Conducting the Count –

See the following pages for:
A. NJ Point survey protocol.

B. NJ Time and Distance Classes datasheet and instructions

C. NJ Time and Exact Distance datasheet and instructions.

E. Point Count datasheet used in NY

2008 GRASSLAND BIRD SURVEY PROTOCOL

Volunteer Commitment Dates: April 12, 2008 – July 31, 2008

Time of day to conduct surveys: 5:30 am – 9:30 am

Pre-survey Wait Period	Wait 2 minutes prior to starting survey
Number of minutes at each point:	5 minutes: separated into 5 one-minute periods
Number of visits per point:	One for pre-survey scouting and two for bird and habitat surveys
Bird and habitat surveys	One from May 15-31 and one from June 1-15
Data Entry	Entered electronically and mailed to NJAS by July 31, 2008

Minimum number of points surveyed in one day: 1 Route/Site

Protocol for volunteers

All citizen scientists are required to attend a training workshop. During this workshop, routes and/or sites will be assigned and corresponding maps will be handed out. Each volunteer will be required to do at least one route/site. We will make every attempt to match volunteers to their preferred counties. Volunteers are welcome to survey multiple routes; but do not try to be too ambitious and take on more than you can handle. It will be much more difficult to reassign routes after the surveys have been initiated, and they all need to be completed this year.

Reporting Time

All volunteer hours spent performing grasslands bird surveys must be recorded on the provided timesheet. The project name is 2008 Grasslands Bird Surveys. In addition to the project name please record the Site Code, especially if you are working on more than one route/site. Make sure that all information is filled in every time you go into the field to work on this project. This includes scouting, bird surveys, data entry, etc. Also be sure to record the miles traveled during each survey. NJAS must provide this timesheet to our partners at the Division of Fish and Wildlife. It is essential that this form be completed and returned to NJAS with your data sheets at the end of the field season.

Scouting

Prior to the first bird survey, every point in each route/site needs to be scouted to determine suitability and accessibility. This initial visit must take place from April 12 – May 14. If a point is inaccessible or unsuitable, the point may be moved to suitable habitat at a nearby location. To move a point, choose a location with suitable habitat on your route map that is at

least 0.5 mile (straight distance) from any other point. Suitable habitat is an open area (no trees or shrubs), greater than 5 hectares (12.5 acres) and dominated by grasses and forbs. When you find the new point location, draw an arrow on the route map from the old point location to the new one and indicate why it was moved (developed, inaccessible, etc). If there are no other suitable locations that meet the criteria to move a point, then mark it on the map with an X and indicate why it was not surveyed (developed, inaccessible, etc.). PLEASE LET US KNOW (kristin.mylecraine@njaudubon.org) about any points that you move. If the area around the original point is not a grassland habitat anymore, for example, it has been developed, please let us know immediately.

Bird Surveys

Make sure you are familiar with the songs of species likely to be seen during your surveys, and the points on identification. Some species are rather secretive and do not allow close approach for visual identification. We have provided CDs of songs to all participants in the training workshops, and you are encouraged to keep practicing. We recommend you use a good field guide for visual identification.

Each volunteer will be responsible for one or more routes and/or sites. A route follows existing roads through grassland habitat and consists of survey points. Each point is located at a pre-determined location from which the observer conducts the bird survey. The radius around each point for 100 meters is considered the "map-circle". An interior circle with a 25 meter radius is also part of the map-circle. Routes vary in length and have different numbers of points.

A site is a property that contains grassland habitat, which is being managed for grassland bird species. Observers are granted permission by the landowner (through their contract with the State) to enter the property to survey. Site sizes vary, but most contain 1-5 survey points with the same count circle method employed.

> ***Note on Routes: those of you who have been assigned a roadside route must run the first bird survey in numerical order by point from the lowest number to the highest number. The second run is done in reverse going from the highest point number to the lowest. This is done so that points aren't surveyed at the same time of day during each survey period.***

Surveys should not be conducted during rain or during periods of high winds (greater than 12mph {Beaufort 3}, which is enough to constantly move leaves or twigs and to extend a light flag). Every point in a route must be surveyed on the same day. Surveys will take place from one half hour before to four hours after sunrise (approximately between 5:30 AM and 9:30 AM), two times during the breeding season, preferably from May 15-31, and June 1-15. Surveys must take place at least 7 days apart. For example, do not conduct one of your surveys on May 31st and the other one on June 4.

Once the observer arrives at the survey point wait 2 minutes before beginning the count. This enables the observer to prepare for the count and allows the birds to calm down and return to normal activity. During the survey the observer stands at the point for 5 minutes and records on the data sheet all grassland bird species seen or heard. This 5-minute period is divided into

five one-minute periods. The observer records the species and number of birds seen or heard during the each minute separately. Record all birds as less than 25 meters, 25-100 meters or greater than 100 meters away from the survey point on the data sheet. Plot all individuals of target species observed at less than 100 meters on the circle map with the abbreviation of the common name (see Appendix III). ***Do not count longer than five minutes.*** Do not exceed the 5-minute time limit because you are sure a certain "good bird" is there and not calling -- it will probably be recorded some other year, and valid negative data are as important as positive data in this survey. Species recorded that are not found on the form should be added at the bottom. ***If you observe a target species before or after the 5-minute survey, write it down in the margin or blank spaces on the bottom of the datasheet with a "before" or "after" next to it.***

One and only one observer should conduct the count. Counting should be done from outside the car from a stationary point. Absolutely no method of coaxing birds should be used during the 5-minute survey period. This means no "spishing", tape playbacks or any other method of enticing a bird to sing or call or make itself visible. It is crucial that all surveys be done consistently. Target birds observed between stops should not be counted, but may be noted in the margin of the route map with a line indicating the location of the species. Such birds are of interest, but do not spend extra time pursuing them, as it is important to finish within the time limit; bird activity changes drastically after this time.

Be sure you record the survey site code, survey point number, observer, recorder (if applicable), date, start time and weather conditions on every datasheet.

Each survey will be undertaken singly or by two people. We prefer single observers because we do not want the volunteer's ability to concentrate on the birds to be compromised by the presence of another person. However, if you want to conduct the surveys with your birding partner, please take all precautions to avoid being distracted. Remember, only one person should be the primary observer. The second person can act as the recorder in this situation. If there are two observers, the primary observer says what she/he sees or hears to the recorder in a quiet voice and the recorder repeats back what she/he heard as the data is recorded. Only the birds seen and heard by the primary observer get recorded on the forms. ***If the recorder sees or hears a target species before or after the 5-minute survey, write it down in the margin or blank spaces on the bottom of the datasheet with a statement that this is a recorder observation.***

> *****Note on Counting the Same Bird: The same bird seen/heard in the 3-minute portion of the survey, then seen/heard again in the 2-minute portion is ONLY recorded in the 3-minute period as this is definitely a single individual. If you are sure that a bird observed in the 2-minute period is different from the one observed in the 3-minute period, by all means record it as a different individual in the 2-minute time slot. Noting on the data sheet that you were sure two different birds were observed will help with our data entry.***

In all situations, avoid biasing the data by disturbing the birds. Walk out of your car quietly, approach the survey point cautiously, avoid unnecessary movements and try to blend in as much as possible.

Data Entry

All observers will have access to NJAS's online data entry website. Go to http://www.njaudubon.org/Research/CitizenScience/Grassland_Surveys.html. At the bottom of the page you can click on **Enter Data**. This will send you to a new page. Click on the link: http://www.njaudubon.org/Grasslands2008. At the bottom of the page click **Create a New Account.** Enter a User ID for yourself. Enter a password (at least 5 characters) and confirm that password. Enter your name, phone number and email address in the appropriate box. In the **Site Password** box type **grassland2008**. A page will open that asks you for the new User ID and password. Type them in, hit enter and you should be relocated to the data entry page. If you have any technical difficulties with this please let me know immediately so we can correct the problem. Once you have entered all of your data please mail all data sheets by August 31, 2008 to:

Kristin Mylecraine
New Jersey Audubon Society
Scherman-Hoffman Wildlife Sanctuary
11 Hardscrabble Road
Bernardsville, NJ 07924

Thank you for your assistance and good luck with all of your surveys.

GRASSLAND BIRD SURVEY 2008 – NJAS CITIZEN SCIENCE PROGRAM

Observer: **Recorder:**   **Date (mm/dd/yyyy):**

Weather Conditions: Temperature (°F) -
                                              Wind at Start (use code from back) -
                                              Sky Code (use code from back) -

Survey Site/Route Code: **Survey Point Number:**   **Start Time (hhmm):**

	1st Minute			2nd Minute			3rd Minute			4th Minute			5th Minute		
	<25m	25m-100m	>100m	<25m	25m-100m	>100m	<25m	25m-100m	>100m	<25m	25m-100m	>100m	<25m	25m-100m	>100m
American Kestrel															
Bobolink															
Eastern Meadowlark															
Grasshopper Sparrow															
Horned Lark															
Northern Bobwhite															
Northern Harrier															
Savannah Sparrow															
Upland Sandpiper															
Vesper Sparrow															
Black-billed Cuckoo															
Blue Grosbeak															
Blue-winged Warbler															
Brown Thrasher															
Chestnut-sided Warbler															
Eastern Bluebird															
Eastern Towhee															
Field Sparrow															
Golden-winged Warbler															
Indigo Bunting															
Prairie Warbler															
Red-winged Blackbird															
White-eyed Vireo															
Yellow-billed Cuckoo															
Yellow-breasted Chat															

Number of Cars Passed (if applicable):   **Excessive Noise (describe):**   **AdditionalComments:**

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Thank you for participating in the Grasslands Bird Monitoring Program

Instructions for Completing Grasslands Bird Survey Data Sheet

Please Print Clearly

1) **Observer**: record name of observer

2) **Recorder**: record name of individual other than observer recording the data (if applicable)

3) **Date**: record date in mm/dd/yyyy format (e.g. – May 21, 2008 = 05/21/2008)

4) **Weather Conditions**: record temperature in degrees Fahrenheit
   record wind at start using codes supplied below: *NOTE – surveys should not be conducted when winds are above Beaufort 3*
   record sky code using codes supplied below: *NOTE – surveys should not be conducted during codes 5-8*

5) **Survey Site Code**: record survey site code supplied in legend on aerial photo

6) **Survey Point Number**: record survey point number supplied in legend on aerial photo

7) **Start Time**: record start time as hhmm (e.g. – 8am = 0800)

8) **Species**: record all species listed on front in appropriate count circle radius and time period

9) **Number of Cars Passed**: record number of cars passed if applicable

10) **Excessive Noise**: indicate if excessive noise affected your ability to detect birds (i.e. – farm equipment, aircraft, etc.)

11) **Additional Comments**: record any additional information that may be of interest to us.

	Wind Speed Codes			**Sky Codes**	**Observation Codes**	
Beaufort	**MPH**	**Indicators**	0	clear or few clouds	Seen	S
0	<1	smoke rises vertically	1	partly cloudy or variable sky	Heard	H
1	1 to 3	wind direction shown by smoke drift	2	cloudy (broken) or overcast	Seen & Heard	SH
2	4 to 7	wind felt on face; leaves rustle	4	fog or smoke	Over Flight	OF
3	8 to 12	leaves, small twigs in constant motion; light flag extended	5	drizzle		
4	13 to 18	dust, leaves, and loose paper lifted, small tree branches move	7	snow		
5	19 to 24	small trees in leaf begin to sway	8	showers		

Survey Instructions on Back

GRASSLAND BIRD SURVEY 2008 – NJAS CITIZEN SCIENCE PROGRAM

Observer: **Recorder:**   **Date (mm/dd/yyyy):**

Weather Conditions: Temperature (°F) -
                                Wind at Start (use code from back) -
                                Sky Code (use code from back) -

Survey Site/Route Code: **Survey Point Number:**   **Start Time (hhmm):**

	1st Minute		2nd Minute		3rd Minute		4th Minute		5th Minute	
	#	Distance	#	Distance	#	Distance	#	Distance	#	Distance
American Kestrel										
Bobolink										
Eastern Meadowlark										
Grasshopper Sparrow										
Horned Lark										
Northern Bobwhite										
Northern Harrier										
Savannah Sparrow										
Upland Sandpiper										
Vesper Sparrow										
Black-billed Cuckoo										
Blue Grosbeak										
Blue-winged Warbler										
Brown Thrasher										
Chestnut-sided Warbler										
Eastern Bluebird										
Eastern Towhee										
Field Sparrow										
Golden-winged Warbler										
Indigo Bunting										
Prairie Warbler										
Red-winged Blackbird										
White-eyed Vireo										
Yellow-billed Cuckoo										
Yellow-breasted Chat										

Number of Cars Passed (if applicable):   **Excessive Noise (describe):**   **AdditionalComments:**

Thank you for participating in the Grasslands Bird Monitoring Program

Instructions for Completing Grasslands Bird Survey Data Sheet

Please Print Clearly

1) **Observer**: record name of observer

2) **Recorder**: record name of individual other than observer recording the data (if applicable)

3) **Date**: record date in mm/dd/yyyy format (e.g. – May 21, 2008 = 05/21/2008)

4) **Weather Conditions**: record temperature in degrees Fahrenheit
record wind at start using codes supplied below: *NOTE – surveys should not be conducted when winds are above Beaufort 3*
record sky code using codes supplied below: *NOTE – surveys should not be conducted during codes 5-8*

5) **Survey Site Code**: record survey site code supplied in legend on aerial photo

6) **Survey Point Number**: record survey point number supplied in legend on aerial photo

7) **Start Time**: record start time as hhmm (e.g. – 8am = 0800)

8) **Species**: record all species listed on front in appropriate count circle radius and time period

9) **Number of Cars Passed**: record number of cars passed if applicable

10) **Excessive Noise**: indicate if excessive noise affected your ability to detect birds (i.e. – farm equipment, aircraft, etc.)

11) **Additional Comments**: record any additional information that may be of interest to us.

Wind Speed Codes   **Sky Codes**   **Observation Codes**

Beaufort	MPH	Indicators				
0	<1	smoke rises vertically	0	clear or few clouds	Seen	S
1	1 to 3	wind direction shown by smoke drift	1	partly cloudy or variable sky	Heard	H
2	4 to 7	wind felt on face; leaves rustle	2	cloudy (broken) or overcast	Seen & Heard	SH
3	8 to 12	leaves, small twigs in constant motion; light flag extended	4	fog or smoke	Over Flight	OF
4	13 to 18	dust, leaves, and loose paper lifted, small tree branches move	5	drizzle		
5	19 to 24	small trees in leaf begin to sway	7	snow		
			8	showers		

Datasheet used in New York

NECBM Grassland Bird Monitoring Program
2008 Data Collection Sheet

Distance from trail/road:

Observer: _____ UTMs Easting: _____

Location: _____   Northing: _____

Point #: _____ Visit: 1st 2nd   Date: _____ Datum: _____
e.g. WGS1984

Precipitation: None   Fog*   Mist   Light rain*   Heavy Rain*   (*outside prescription
                                                                    for survey)
Wind: 0   1-5   6-10   >10*   Temp: _____

Cloud cover: 0%   1-15%   16-40%   41-75%   76- 90%   91-100%

Time started: _____

Detection codes:
0 - undetected   1 - seen only   2 - singing only
3 - seen and heard   4 - calling/chipping only
or
0 - undetected   1 - seen only   2 - singing only
3 - seen and heard   4 - calling/chipping only

Minutes

	Species	Distance	1-3	4-5	6	7	8	9	10		Breeding behaviors (code)
ex.	*SAVS*	*47*	*0*	*2*	*3*	*3*	*2*	*0*	*1*		F
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											

N - carrying nesting material
F - carrying food
G - carrying egg fragments
S - carrying fecal sack
L - local young

Note: Ignore BOBO and SAVS >100 m unless none detected <100 m

1) Habitat disturbed (e.g. mowed/hayed) during breeding season: Yes   No
1a) If yes, % disturbed: 1-25%   26-50%   51-75%   76-100%

2) Point landuse: Cons. Grass   Hayfield   Pasture   Fallow   RowCrop   Seed Crop
Open Space/Park   Successional (~ >25% shrub cover)

3) Vegetation (Ignore the following fields when more rigorous sampling will be occurring):

Vegetation height: _____   % Grass _____   Dominant Grass: _____

Litter depth: _____   % Forb _____   Dominant Forb: _____

Shrub cover: _____   Nearest: _____   Averaged Height/Density (Robel Pole): _____

(7/1/2008) **SO**

SOP 6: Documenting Habitat Variables –

Example datasheet provided by the New Jersey monitoring program.

Observer Name: _____   Date: _____

Site Name: _____   Point ID: _____

---

1. Overall Habitat Category - Check the box that best describes the overall habitat

UPLAND ☐   WETLAND ☐

---

2. Habitat Class-Check the type(s) that best describes the predominant habitat surveyed (>50%)

OF	Old Field ☐	HAY	Hay ☐	
CR	Cropland ☐	P	Pasture ☐	
TF	Tilled field ☐	L/S	Lawn/Sod ☐	
FOR	Forest ☐	SC	Scrub-shrub ☐	
	☐	DE	Developed ☐	

---

3. Average Height-Check the box that best describes the GRASSLAND habitat in the survey area

ANK	Ankle ☐	AW	Above waist ☐	
KN	Knee ☐	AH	Above head ☐	
WST	Waist ☐	MX	Mixed heights ☐	

---

4. Map Changes - Did you mark any habitat changes on your map?

YES ☐
NO ☐

SOP 7: Data Management

See the relevant sections of the protocol. Data will be provided to AKN, but appropriate reports will need to be providing to the lead analyst.

SOP 8: Data Analysis

As analysis of important covariates and sampling methodologies are underway, a SOP has not yet been developed.

SOP 9: Reporting

No recurring reports have yet been developed. However, data should be reported annually to the lead analyst for the project.

SOP10: Procedures and Equipment Storage After the Field Season

See the appropriate sections above on data entry and database management. Little equipment other than personal gear may be necessary other than rangefinders and/or GPS units. Any borrowed or loaned equipment should be returned immediately upon completion of the field season to ensure that none is misplaced.

SOP11: Revising the Protocol

The official protocol for this project has not been finalized. The process for developing the protocol will follow completion of the current analysis, and requires cooperation from the various partners that will likely participate. This development process will be the model for future protocol revision.

Appendices
(found in appendices.pdf)

See attached files

Appendix 1: "Sample format for repeated sampling data entry"

Appendix 2: "Bulleted outline of activities during the project year

Appendix 3: "Table of summary statistics for endangered, threatened and special concern species observed during point count bird surveys conducted in New Jersey between May 15th and June 15th, 2006. Example only -- not based on accurate data"

Appendix 4: "Graph of total numbers of grassland bird counted by year at sites under different management regimes -- Example only, not based on accurate data"